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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/387,164	08/31/1999	YONGJUN HU	303.607US1	2253
21186	7590	01/11/2005	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			ROY, SIKHA	
			ART UNIT	PAPER NUMBER
			2879	

DATE MAILED: 01/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/387,164

Applicant(s)

HU, YONGJUN

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

The Response, filed on October 26, 2004 has been entered and is acknowledged by the Examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3,5,7,9,11,13-15,17-19, 21-26 are rejected under 35

U.S.C. 102(b) as being anticipated by U. S. Patent 5,534,743 to Jones et al.

Regarding claim 1 Jones discloses (Figs. 24, 25 column 17 lines 31-57) a field emitter display device comprising emitter 402 comprising a cylindrical body portion 404 and tip portion 406 having a layer 409 conforming to the entire surface of the emitter (formed on the tip and on the side walls of the emitter column) by ion beam deposition. Jones further discloses the ion beam deposited

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layer or ion implanted layer (408 in Fig. 24, 409 in Fig. 25) is formed of silicon monoxide layer providing tunneling layer for emission of electrons.

The Examiner notes that the claim limitation "implanted oxide layer" is drawn to a process of manufacturing (formed by implantation) which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). Therefore, it is the position of the examiner that it would have been obvious to one of ordinary skill in the art that the emitter with ion beam deposited silicon monoxide layer disclosed by Jones is at least a fully functional equivalent to the Applicant's claimed emitter with implanted oxide layer as evidenced by Jones suggestion of all of the Applicant's claimed structural limitations.

Regarding claim 2 the limitation reciting for inhibiting outgassing is functional and is inherent to the emitter of Jones as evidenced by Jones' disclosure of all the claimed structural limitations.

Referring to claims 3,5,7,9,11 Jones discloses the structure of the emitter having ion beam deposited or implanted oxide layer conforming to the entire surface of the emitter for emission of electrons. The limitations reciting 'for lowering potential barrier', 'for affecting a lowering mechanism', 'for affecting an

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image force' and 'for enhancing the Schottky effect' to enhance the emission of electrons are inherent to the emitter of Jones as evidenced by Jones' disclosure of all the claimed structural limitations.

Claims 13 and 15 essentially recite the same limitations as of claims 2 and 3 and hence are rejected for the same reason.

Regarding claims 14 Jones discloses (column 17 lines 49-51 Fig. 25) the overlayer 409 is applied by ion beam deposition and hence is embedded in the surface of the emitter 402.

Claims 17,19 and 21 essentially recite the same limitation as of claims 7,9 and 11 respectively and hence are rejected for the same reasons.

Claims 18 and 22 recite the same limitations as of claim 14 and hence are rejected for the same reason.

Regarding claims 23,24 Jones discloses (column 17 lines 31-36, 49-55) silicon oxide implantation layer conforming to the entire surface of the emitter for releasing electrons at a predetermined energy level.

Claims 25 and 26 essentially recite the same limitation as of claim 23 and hence are rejected for the same reason (the embedded layer being same as implanted layer).

Claims 3, 5,7,9,11,13 -15,17-19, 21,22,33-36 are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent 6,130,106 to Zimlich.

Regarding claim 3 Zimlich discloses (column 1 lines 39-48, column 2 lines 20-48) a field emission display comprising electron emitters having ion-

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implantation. Implanting ions in an appropriate manner an emitter with a maximum desired current is produced, the implantation lowering the potential and hence enhancing electron emission. This ion implantation layer (first implanted layer 34 and second ion implanted region 38) is set at a desired maximum to limit the current from the resulting emitter to a maximum and is conforming to the entire surface of the emitter (Fig. 3). The limitation reciting the implantation layer lowering the potential barrier is functionally inherent to the emitter.

Regarding claim 5 Zimlich discloses an emitter having implantation region (formed of first region 34 with doped or implanted silicon layer and second implanted layer 38), conforming to the entire surface of the emitter. The limitation reciting the implantation layer affecting a lowering mechanism to enhance the release of electrons is functionally inherent.

Regarding claim 7 the limitation reciting the implantation layer affecting the image force so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 9 Zimlich discloses the field emission display with emitters having an implantation. The limitation reciting the implantation layer enhancing the Schottky effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 11 Zimlich discloses the field emission display with emitters having an implantation layer. The limitation reciting the implantation

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layer decreasing the dielectric effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Claims 13 and 15 recite the same limitation as of claims 3 and 5, the emitter having implantation layer (formed of 34 and 38) conforming to the entire surface of the emitter. Regarding the limitation comprising the implantation layer limits outgassing is functionally inherent to the emitter.

Regarding claim 14 Zimlich discloses the ion implantation layer embedded in the surface of the emitter.

Claims 17,19 and 21 essentially recite the same limitation as of claims 7,9 and 11 respectively and hence are rejected for the same reasons.

Claims 18 and 22 recite the same limitation as of claim 14 and hence are rejected for the same reason.

Regarding claim 33 Zimlich discloses a field emission display device (Fig.1, column 2 lines 1-15) comprising emitters 16 having ion implantation which produces current at a desired level, reduces potential barrier enhancing electron emission yielding maximum current and reduces work function and inhibits degradation by reducing outgassing. Zimlich further discloses a light-emitting target layer 26 that radiates when released electrons strike the light-emitting target.

Regarding claims 34 and 35 Zimlich discloses phosphor particles 28 over the pixel regions in the light-emitting target layer 26.

Regarding claim 36 Zimlich discloses (column 3 lines 9-25) knowing the maximum emission current, the maximum number of ions and hence maximum

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implantation in the emitter can be calculated and this emitter can be used in Video Graphics Array.

Claims 3,5,7,9,11,13,14 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,141,460 to Jaskie et al.

Regarding claim 3 Jaskie discloses (Figs. 4A,4B,4C column 2 lines 53-66, column 3 lines 8-36) a field emitter 402 (electrode) having implantation 404 (implantation of carbon nucleation sites) wherein the implantation is conforming to the entire surface of the emitter. Jaskie further discloses the field emission electron emitter with implanted layer exhibits a number of desirable operating characteristics. The limitation reciting 'for lowering potential barrier' to enhance the emission of electrons are inherent to the emitter of Jaskie as evidenced by Jaskie's disclosure of all the claimed structural limitations.

Regarding claim 5 Jaskie discloses an emitter having implantation region 404, conforming to the entire surface of the emitter 402. The limitation reciting the implantation layer affecting a lowering mechanism to enhance the release of electrons is functionally inherent.

Regarding claim 7 the limitation reciting the implantation layer affecting the image force so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 9 Jaskie discloses the field emission display with emitters having an implantation. The limitation reciting the implantation layer enhancing

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the Schottky effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 11 Jaskie discloses the field emission display with emitters having an implantation layer. The limitation reciting the implantation layer decreasing the dielectric effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Claims 13 and 15 recite the same limitation as of claims 3 and 5, the emitter having implantation layer (formed of carbon ions) conforming to the entire surface of the emitter. Regarding the limitation comprising the implantation layer limits outgassing is functionally inherent to the emitter.

Regarding claim 14 Jaskie discloses the ion implantation layer embedded in the surface of the emitter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4,6,8,10,12,16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,534,743 to Jones et al.

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Referring to claims 4,6, 8,10,12,16 and 20 Jones discloses the claimed invention except for the implantation layer being underneath the surface of the emitter. It would have been an obvious matter of design choice to have the implanted layer underneath the surface of the emitter as the Applicant has not disclosed that this solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the implantation layer embedded in the surface of the emitter.

Claims 4,6,8,10,12,16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,130,106 to Zimlich.

Referring to claims 4,6, 8,10,12,16 and 20 Zimlich discloses the claimed invention except for the implantation layer being underneath the surface of the emitter. It would have been an obvious matter of design choice to have the implanted layer underneath the surface of the emitter as the Applicant has not disclosed that this solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the implantation layer embedded in the surface of the emitter.

Claims 1,2, 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,130,106 to Zimlich in view of U. S. Patent 5,311,055 to Goodman et al.

Regarding claim 1 Zimlich discloses implantation by ions such as arsenic, antimony or phosphor. Zimlich does not disclose an implanted oxide layer.

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Goodman et al. in pertinent art of semiconductor transistor emitters disclose (column 7 lines 7-30, Fig.5) a thin sacrificial oxygen implantation pattern is produced by implanting the emitter region with oxygen by well-known SIMOX process.

The selection of known material for a known purpose is generally considered to be within the skill of the art. It would have been obvious to one of ordinary skill in the art at the time of invention to use oxygen for ion implantation for the emitter of Zimlich as suggested by Goodman et al. for selection of known material for a known purpose is considered to be within the skill of the art.

Regarding claim 2 Zimlich discloses the implanted layer reduces work function and hence inhibits outgassing.

Referring to claims 23 and 24 Zimlich in view of Goodman et al. disclose oxygen ion implantation producing silicon oxide layer and releasing electrons at a predetermined energy level.

Claims 25 and 26 essentially recite the same limitation as of claim 23 and hence are rejected for the same reason (the embedded layer being same as implanted layer).

Claims 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,130,106 to Zimlich in view of U. S. Patent 5,372,973 to Doan et al.

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Regarding claim 27 Zimlich does not disclose an emitter having external coating on the embedded layer conforming to the surface of the emitter for releasing electrons.

Doan et al. in analogous art of cold cathode emitter tips disclose (column 6 lines 34-56) the cathode tips coated with a low work function material. It is further noted that this external coating results in a sharper emitter tip with a lower work function and greater resistance to erosion.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the external coating of Doan et al. on the embedded layer of the emitter of Zimlich for a sharper emitter tip with a lower work function and greater resistance to erosion. The rest of the limitation is same as of claim 13 and hence is rejected for the same reason.

Claims 28 and 29 recite the same limitation as claims 3 and 5 and the limitation of external coating which has been disclosed by Zimlich and hence are rejected (see rejection of claims 3,5).

Claims 30,31 and 32 recite the same limitations as claims 7,9 and 11 respectively and the limitation of external coating as disclosed by Doan et al. and hence are rejected (see rejection of claims 7,9,11).

Response to Arguments

Applicant's arguments with respect to claims 1-3, 5, 7, 9,11,13-15,17-19 have been fully considered but they are not persuasive.

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In response to applicant's argument Jones does not disclose 'implanted oxide layer' the examiner respectfully disagrees. Jones discloses the over layer formed of silicon monoxide on the emitter tip by ion beam deposition. It is well known in the art that ion beam deposition, ion implantation, ion milling are suitable methods for forming thin film and the products formed by these techniques can be the same. The claim limitation "implanted oxide layer" is drawn to a process of manufacturing (formed by implantation) which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). Therefore, it is the position of the examiner that it would have been obvious to one of ordinary skill in the art that the emitter with ion beam deposited silicon monoxide layer disclosed by Jones is at least a fully functional equivalent to the Applicant's claimed emitter with implanted oxide layer as evidenced by Jones' suggestion of all of the Applicant's claimed structural limitations.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 5,921,838 to Pack et al. and U.S. Patent 5,857,882 to Pam et al. disclose field emitters tips having layer implanted on the emitter for enhancing field emission.

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Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S.R.

Sikha Roy
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